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Corrections of errors in special relativity theory and the influence of paradoxes on it

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Abstract

Analyzing the paradoxes with the theory of relativity, we stop at the ***Doppler effect Paradox****, which hides a very important secret, that the relation of time and space is with the Lorentz transformations wrong for the SS' system and Multiple moving Frames. On the contrary, the relations for the laboratory are correct, i.e. those related to the Mickelson experiment. In this study, we prove that the relations of time and space and therefore of the following quantities, velocity and acceleration, are different from those given by Lorentz. The relation connecting energy and mass with velocity is also wrong and the correct relation is completely different. The speed of light in accordance with the theories of spherical electromagnetic wave and the FRENSEL relation proves that it is probably not constant but is influenced by the density of space and space-time in general. For the twin paradox, we will not mention it because the changes in times and lengths are observational, not real. Therefore, for the paradox of Gemini, it is obvious that the time in essence for the life of the moving person does not change, just the clock is delayed and the length seems shorter that it travels. Just changes that are electronic, mechanical or generally observational and not real. Also, a generalization is given for fractional calculus regarding the expansion of time according to fractional integration.*

Relativistic time dilation and contraction

In classical mechanics, and in special relativity, an inertial reference frame (IR) is a system in which a body that is free from all external effects, including gravity, does not accelerate. Any Inertial Frame moving at a constant velocity relative to its predecessor is also an inertial frame. According to the principle of relativity Galileo's Galilean principle, which applies to Newtonian mechanics, the laws of mechanics have the same form with respect to all inertial systems and the correct transformations from one system to another are Galileo's transformations. Einstein, in his special theory of relativity, extended the principle of relativity to include all the laws of physics, including the laws of mechanics, but in this theory the correct transformations are the Lorentz transformations. In these transformations, however, there are problems which are important, as we shall see, for the correct solution of the basic elementary relations of the laws of physics [1, 2, 3, 5, 6, 13, 15]. *The Doppler paradox alone proves that the Lorentz transformations contradict each other; and therefore lead to absurdity and are not the true logical transformations.*

I. Expansion of time

I.1). Time dilation for a moving vehicle between two external points with a distance greater than its length.

Suppose we have a spaceship moving at speed u in the direction $\overrightarrow{OB}$. When it is at O it sends a signal to the Earth observer at A. When it reaches B it sends a signal from there to A. The difference in time is δ t. We want to calculate the distances to go from O to B and from O to A and compare these times with the time it will take to go from A to B.Then we have to calculate the distances OB, OA and AB.The triangle OAB as in (figure.1) is a serangular as we define it and therefore we will have:

$$OB^2 + AB^2 = OA^2$$

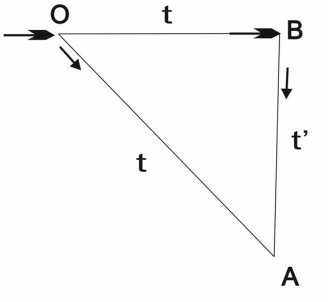

Figure 1:

Because the movements on the directions OA and OB are simultaneous, **we assume that they will take place in equal times t**. In contrast, the movement of light on the line AB is in different times, so we will call it t', so according to the Pythagorean theorem we will have the following.

$$(c \cdot t')^2 + (u \cdot t)^2 = (c \cdot t)^2 \Rightarrow$$

$$t = \frac{t'}{\sqrt{1 - \left(\frac{u}{c}\right)^2}} \tag{1}$$

It is very important because over long distances we can only communicate with signals and especially bright ones, we need to calculate the time δt. According to the figure 2, will apply:

$$\delta t = OB_t + BA_{t'} - OA_t = \frac{OB}{u} + \frac{AB}{c} - \frac{OA}{c} \tag{2}$$

This is a generalized relation that separates the moving system from the stationary observer. If we now want to identify the relativistic state with an observer and a moving system, we must assume in relation (2) that

$$\delta t = BA_{t'} = \frac{AB}{c} \Rightarrow \tag{3}$$

$$\frac{OB}{u} - \frac{OA}{c} = 0 \tag{4}$$

Now we need to calculate the $OB,\ OA$ in relation to AB. From relation (4) it

$$OB^2 \left(1 - \left(\frac{u}{c}\right)^2\right) = AB^2 \left(\frac{u}{c}\right)^2 \Rightarrow$$

$$OB = \frac{AB\left(\frac{u}{c}\right)}{\sqrt{1 - \left(\frac{u}{c}\right)^2}} \tag{5}$$

$$OA^2 = AB^2 + OB^2 = AB^2 + \frac{AB^2\left(\frac{u}{c}\right)^2}{1 - \left(\frac{u}{c}\right)^2} = \frac{AB^2}{1 - \left(\frac{u}{c}\right)^2} \Rightarrow$$

$$OA = \frac{AB}{\sqrt{1 - \left(\frac{u}{c}\right)^2}} \tag{6}$$

Finally, from (3) it follows that

$$\begin{aligned} \delta t &= \frac{AB}{c} \Rightarrow \\ AB &= c \cdot \delta t \end{aligned} \tag{7}$$

Since we know the time difference of the 2 signals, we can find AB and therefore the other quantities OA & OB. In this case we can therefore formulate the time dilation in both systems with the relation

$$\begin{aligned} t &= \frac{t'}{\sqrt{1-\left(\frac{u}{c}\right)^2}}, \gamma = \frac{1}{\sqrt{1-\left(\frac{u}{c}\right)^2}} \Rightarrow \\ t &= t' \cdot \gamma \end{aligned} \tag{8}$$

Which obviously also applies to the spacecraft's propulsion system. So we have the 3 very basic relationships

$$OB = \frac{\delta t \cdot c \cdot \left(\frac{u}{c}\right)}{\sqrt{1-\left(\frac{u}{c}\right)^2}} = \frac{\delta t \cdot u}{\sqrt{1-\left(\frac{u}{c}\right)^2}} \tag{9}$$

$$OA = \frac{\delta t \cdot c}{\sqrt{1-\left(\frac{u}{c}\right)^2}} \tag{10}$$

$$\text{and } AB = \delta t \cdot c \tag{11}$$

So AB is at a given distance exactly. We could solve the times for the 2 systems in general, but now we have symmetry with the last relations, since we force the 2 systems to have the same structure and the same γ, according to the

$$\gamma = \frac{1}{\sqrt{1-\left(\frac{u}{c}\right)^2}}$$

This helps to normalize the data and to make the relationships more uniform. In general, however, the times could not be the same and we would then have relationship (2) without preconditions.

II. Contraction of time

II.1). Time contraction for a moving vehicle between two external points at a distance greater than its length.

In the previous example and for the moving spaceship, if we assume that $OB = DI$, we

$$\begin{aligned} &\Delta t = \Delta t' \cdot \gamma \Rightarrow \Delta t \cdot u = u \cdot \Delta t' \cdot \gamma \Rightarrow \Delta l = \Delta I' \cdot \gamma \Rightarrow \\ &\Delta I' = \Delta l \cdot \sqrt{1-\left(\frac{u}{c}\right)^2} \end{aligned} \tag{12}$$

Therefore, for the moving spacecraft, the pilot observes that it travels a shorter distance $\Delta l'$ length, in relation to the actual Δl. So it measures a **contraction of length**, relative to the measurement made by the stationary observer Δl, which is valid in reality.

II.2). Time contraction for a moving vehicle between two points at the beginning and end of its length.

Suppose a train passes through 2 fixed points O and B, which are the beginning and end of the train figure 2. At the moment it enters from O it sends a signal to the stationary observer A. Then after the whole train has entered between points O and B, the driver at B sends a signal to A. The time difference will be defined as δt. Therefore the relationship will hold due to the right triangle OAB

$$OB^2 + AB^2 = OA^2$$

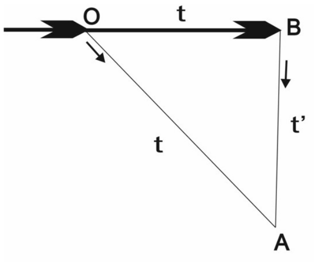

Figure 2:

But more generally with the time difference between the O and B flags will

$$\delta t = OB_t + BA_{t'} - OA_t = \frac{OB}{u} + \frac{AB}{c} - \frac{OA}{c} \tag{13}$$

Because the movements on the directions $\overrightarrow{OA}$ and $\overrightarrow{OB}$ and are simultaneous, we will assume that they will take place in equal times t. In contrast, the movement of light on the line AB is after a lapse of time with respect to t, therefore we will call it t', we will therefore have according to according to the Pythagorean theorem, the following

$$(c \cdot t')^2 + (u \cdot t)^2 = (c \cdot t)^2 \Rightarrow$$

$$t = \frac{t'}{\sqrt{1 - \left(\frac{u}{c}\right)^2}} \tag{14}$$

For this to happen, however, relation 13 must be

$$\delta t = BA_{t'} = \frac{AB}{c} \Rightarrow \tag{15}$$

$$\frac{OB}{u} - \frac{OA}{c} = 0 \tag{16}$$

Of course, in general the times could be different, but for symmetry we assume relation (16) which leads the two systems to relation (14). From relation (14) we obtain the relation

$$t \cdot \sqrt{1 - \left(\frac{u}{c}\right)^2} = t' \Rightarrow u \cdot t \cdot \sqrt{1 - \left(\frac{u}{c}\right)^2} = u \cdot t' \Rightarrow$$

$$L \cdot \sqrt{1 - \left(\frac{u}{c}\right)^2} = L' \tag{17}$$

From relation (17) the length therefore L is the length of the train that will be seen as L' by the stationary observer A and will have contracted. And here of course also apply that

$$OB = L$$

$$OB = \frac{AB\left(\frac{u}{c}\right)}{\sqrt{1-\left(\frac{u}{c}\right)^2}} \Rightarrow AB = \frac{L}{\left(\frac{u}{c}\right)} \cdot \sqrt{1-\left(\frac{u}{c}\right)^2} \tag{18}$$

$$OA = \frac{L \cdot c}{u} \tag{19}$$

II.3). Equivalent contraction scheme for the case II.2

According to the previous logic of contraction, we complete the schematic equivalence scheme as seen below in figure 3. We can consider that the train is contracted as if it were at point Γ, and therefore the final length will be $L' = O\Gamma$. From the figure it can be seen that there is

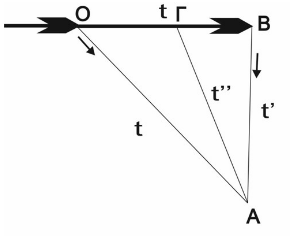

Figure 3:

a new time t''' measured by the stationary observer at A. We have the following equations

$$OB = L = ut,\ \Gamma B = L' = ut',\ AB = ct,\ A\Gamma = ct'',\ OA = ct$$

$$t = \frac{t'}{\sqrt{1-\left(\frac{u}{c}\right)^2}} \tag{1'}$$

$$t'' = t'\sqrt{1+\left(\frac{u}{c}\right)^2} = \tag{2'}$$

$$(1'\&2') \Rightarrow t'' = t\sqrt{1-\left(\frac{u}{c}\right)^4} = \tag{3'}$$

It therefore follows from the schematic arrangement that

$$t' < t'' < t \tag{4'}$$

So as far as the $u \to c$ then $\Gamma \to B$ and $A\Gamma \to AB$. It also applies to distances that

$$A\Gamma = ct'' = ct\sqrt{1-\left(\frac{u}{c}\right)^4} = c\frac{L}{u}\sqrt{1-\left(\frac{u}{c}\right)^4} \tag{5’}$$

$$AB = ct' = ct\sqrt{1-\left(\frac{u}{c}\right)^2} = c\frac{L}{u}\sqrt{1-\left(\frac{u}{c}\right)^2} \tag{6’}$$

$$OA = ct = c\frac{L}{u} \tag{7’}$$

Therefore the distance AB is given and clearly defined, and the length $B\Gamma = L' = L\sqrt{1-\left(\frac{u}{c}\right)^2}$ will always depend on the velocity u of the moving body. With this logical explanation of the expansion contraction, the generalization can be made for each case.

II.4). Expansion - contraction generalisation

The case of contraction is a typical case of contraction expansion because it contains both forms mentioned above. We assume anew a train passing through 2 fixed points O and B, which are the beginning and the end of the train Figure 4. At the moment it enters from B it sends a signal to the sends a signal to A but at an angle $B\hat{O}A = \hat{\varphi}$. The time difference of the signals from B and O, we will define it as δt. Therefore the law of cosines will apply to any triangle OAB and we will have the relation

$$AB^2 = OA^2 + OB^2 - 2 \cdot OA \cdot OB \cdot \cos\varphi \tag{1”}$$

$$\delta t = OA_{t'} = \frac{OA}{c} \Rightarrow \tag{2”}$$

$$\frac{OB}{u} - \frac{AB}{c} = 0 \tag{3”}$$

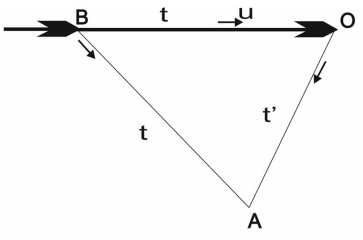

Figure 4:

We know for a right angle that

$$OB = L = ut, AB = ct, OA = ct'$$

$$t = \frac{t'}{\sqrt{1-\left(\frac{u}{c}\right)^2}}\,(4'') \tag{5”}$$

By substituting in (1) we get in general:

$$(ct)^2 = (ct')^2 + (ut)^2 - 2 \cdot utct' \cdot \cos\varphi \Rightarrow$$

$$t^2\left(c^2 - u^2\right) + 2\left(ut'c \cdot \cos\varphi\right) \cdot t - (ct')^2 = 0 \tag{5”}$$

If we now solve equation (5") we obtain the relation

$$t' = t' \cdot \frac{-\frac{u}{c} \cdot \cos\varphi \pm \sqrt{\left(\frac{u}{c} \cdot \cos\varphi\right)^2 + \left(1 - \left(\frac{u}{c}\right)^2\right)}}{\left(1 - \left(\frac{u}{c}\right)^2\right)} \qquad (6")$$

Relation (6") refers to the general relation of the expansion of time. To find the contraction of the length of the train specifically from relation (6") we multiply both parts by the speed of the train u, i.e.

$$t \cdot u = u \cdot t' \cdot \left(\frac{-\frac{u}{c} \cdot \cos\varphi \pm \sqrt{\left(\frac{u}{c} \cdot \cos\varphi\right)^2 + \left(1 - \left(\frac{u}{c}\right)^2\right)}}{\left(1 - \left(\frac{u}{c}\right)^2\right)} \Rightarrow\right.$$

$$L = L' \cdot \left(\frac{-\frac{u}{c} \cdot \cos\varphi \pm \sqrt{\left(\frac{u}{c} \cdot \cos\varphi\right)^2 + \left(1 - \left(\frac{u}{c}\right)^2\right)}}{\left(1 - \left(\frac{u}{c}\right)^2\right)} \right) \Rightarrow$$

$$L' = L \cdot \left(\frac{\left(1 - \left(\frac{u}{c}\right)^2\right)}{-\frac{u}{c} \cdot \cos\varphi \pm \sqrt{\left(\frac{u}{c} \cdot \cos\varphi\right)^2 + \left(1 - \left(\frac{u}{c}\right)^2\right)}} \right) \qquad (7")$$

Relation (7") expresses the generalised contraction of the length of a velocity motor u measured by stationary observer A, but which is at an angle ϕ with respect to the front exit point and the direction of motion. If in relations (6"&7") we substitute for the angle $\phi = \pi/2$ then for time dilation and length contraction we obtain

$$t = \frac{t'}{\sqrt{1 - \left(\frac{u}{c}\right)^2}} \, (8'') \qquad (8")$$

$$L' = L\sqrt{1 - \left(\frac{u}{c}\right)^2} \, (9'') \qquad (9")$$

Which are already known. What is absolutely obvious is that observer A is at a given distance and constant for each angle φ and according to the procedure we have followed we have $OA = c \cdot \delta t$.

In line with the foregoing we summarise 3 very basic observations:

1st. The moving person measures less length and time if it travels a distance of 2 external points at a distance greater than the length of its mobile than that measured by the stationary person.

2nd. The mobile measures the same length for its moving vehicle, but the stationary measures a shorter length than the given length of the moving vehicle.

3rd. We can assume, for symmetry, that the moving system and the stationary one have the same γ and will therefore be recorded, using the same distance-station method of the micelson-morley experiment.

III. Relative moving systems frames S' to stationary S.

III.I. We know from the basic principles of Special Relativity that both time and the intervals of space depend on the reference frame, i.e. space and time are not absolute as they were in Newtonian mechanics, but their transformation laws are combined in such a way that only the speed of light is absolute[15]. Of course, this view must also be explored for any approximation of any state of reality. Taking also into account the other two coordinates $y,\ z$, which are not transformed if the two inertial systems are in the normal configuration, one can consider this given space. Each point in spacetime defines an event occurring at a point in the coordinate space $x,\ y,\ z$, at a time t, and is characterized by the four coordinates $t,\ x,\ y,\ z$. In the three-dimensional Euclidean space R^3 a shift of the coordinate axes implies a transformation in the $x,\ y,\ z$ components of the vector of the relative position between two points, which however defines their respective quadratic distance. We consider 2 coordinate frames S with $(x,\ y,\ z,\ t)$ and S' with $(x',\ y', z',\ t')$ so that S' moves with constant velocity u (uniformly) with respect to S which we consider stationary. If we consider a mirror system as in the Michaelson experiment, we want to calculate intervals and times in each system separately. So we have two events let A and B, in this case, were the emission of a light ray at $O \equiv O'$ at time $t = t' = 0$ and as figure 5, the passage of the ray through to a general point with coordinates $(x,\ y,\ z,\ t)$ and $(x',\ y',\ z',\ t')$ respectively. Now assume that S' is moving with corresponding intervals will be x and x' for each frame espectively.

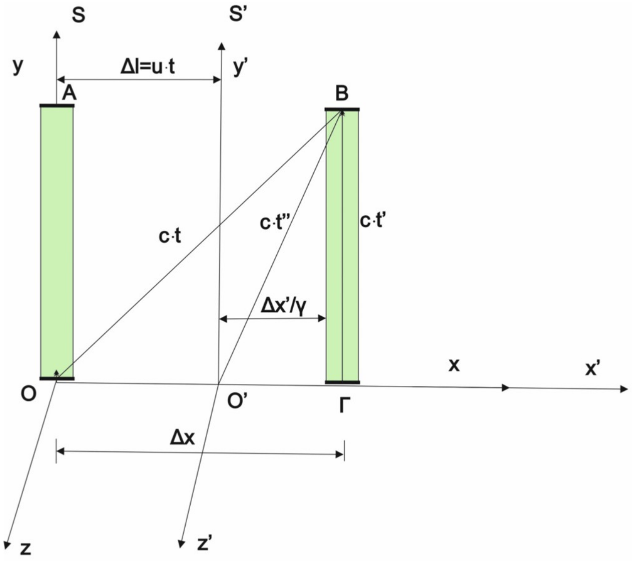

Figure 5:

We return to the figure and the fact of point B. We must repeat that if an event has coordinates $(x,\ y,\ z,\ t)$ in S and $(x',\ y',\ z',\ t')$ in S'. Then for relation from S' in S we apply the relation

$$x = \frac{x'}{\gamma_1} + u \cdot t \tag{III.1}$$

and if we take the relation in the form of variations we get the equation

$$\Delta x = \frac{\Delta x'}{\gamma_1} + u \cdot \Delta t \tag{III.2}$$

The Relation (III.2) becomes

$$\begin{aligned}
&\Delta x=\frac{\Delta x'}{\gamma_1}\cdot\frac{\Delta t'}{\Delta\tau'}+u\cdot\Delta t\Rightarrow\\
&\frac{\Delta x}{\Delta t}=\frac{\Delta x'}{\gamma_1}\cdot\frac{\Delta t'}{\Delta t'}\cdot\frac{1}{\Delta t}+u\Rightarrow\\
&u_x=u_x'\cdot\frac{\Delta t'}{\Delta t}\cdot\frac{1}{\gamma_1}+u\Rightarrow\\
&u_x'=\frac{u_x-u}{\frac{\Delta t'}{\Delta t}\cdot\frac{1}{\gamma_1}}=\frac{u_x-u}{\frac{\Delta t'}{\Delta t}}\cdot\gamma_1=(u_x-u)\cdot\gamma_1\cdot\gamma_2 \qquad \text{(III.3)}\\
&\text{ if }\gamma_2=\frac{\Delta t}{\Delta t'}
\end{aligned}$$

But we see here that we do not know γ_1, $\frac{\Delta t'}{\Delta t}$, we have to calculate them according to the figure and in what happens in the frames S and S'. According to figure 5 we will first calculate the $\frac{1}{\gamma_2}=\frac{\Delta t'}{\Delta t}$ which is essential for the proof we seek. From the triangle OBΓ we have, knowing the distances for the optical rays and the motion with total length Δx

$$\begin{aligned}
&(c\cdot\Delta t)^2=(c\cdot\Delta t')^2+(\Delta x)^2\Rightarrow\\
&\left(\frac{\Delta t'}{\Delta t}\right)^2=1-\left(\frac{\Delta x}{c\cdot\Delta t}\right)^2\Rightarrow\\
&\frac{\Delta t'}{\Delta t}=\sqrt{1-\left(\frac{u_x}{c}\right)^2}\Rightarrow\\
&\gamma_2=\frac{\Delta t}{\Delta t'}=\frac{1}{\sqrt{1-\left(\frac{u_x}{c}\right)^2}} \qquad \text{(III.4)}
\end{aligned}$$

All that remains is to calculate γ_1 in the S' frame. That is, we need to calculate the $\frac{\Delta t''}{\Delta t'}$. For this purpose we take the right triangle O'BΓ and according to the well-known logic we have

$$\begin{aligned}
&(c\cdot\Delta t'')^2=(c\cdot\Delta t')^2+\left(\frac{\Delta x'}{\gamma_1}\right)^2\Rightarrow\\
&\left(\frac{\Delta t''}{\Delta t}\right)^2=\left(\frac{\Delta t'}{\Delta t}\right)^2+\left(\frac{\Delta x-u\cdot\Delta t}{c\cdot\Delta t}\right)^2\Rightarrow\\
&\frac{\Delta t''}{\Delta t}=\sqrt{\left(\frac{\Delta t'}{\Delta t}\right)^2+\left(\frac{u_x-u}{c}\right)^2}\Rightarrow\\
&\frac{\Delta t''}{\Delta t}=\sqrt{1-\left(\frac{u_x}{c}\right)^2+\left(\frac{u_x-u}{c}\right)^2}\Rightarrow\\
&\frac{\Delta t''}{\Delta t}=\sqrt{1+\frac{u^2-2u_x\cdot u}{c^2}} \qquad \text{(III.5)}
\end{aligned}$$

From relations III.4, III.5 we obtain the relation we are interested in

$$\gamma_1 = \frac{\Delta t''}{\Delta t'} = \frac{\sqrt{1+\frac{u^2-2u_x\cdot u}{c^2}}}{\sqrt{1-\left(\frac{u_x}{c}\right)^2}} \tag{III.6}$$

What we are ultimately interested in is speed

$$\begin{aligned}
u_x' &= \frac{u_x-u}{\frac{\Delta t'}{\Delta t}\cdot\frac{1}{\gamma_1}} = \frac{u_x-u}{\frac{\Delta t'}{\Delta t}}\cdot\gamma_1 = (u_x-u)\cdot\gamma_1\cdot\gamma_2 \Rightarrow \\
u_x' &= (u_x-u)\cdot\frac{\sqrt{1+\frac{u^2-2u_x\cdot u}{c^2}}}{\sqrt{1-\left(\frac{u_x}{c}\right)^2}}\cdot\frac{1}{\sqrt{1-\left(\frac{u_x}{c}\right)^2}} \Rightarrow \\
u_x' &= \frac{(u_x-u)}{1-\left(\frac{u_x}{c}\right)^2}\cdot\sqrt{1+\frac{u^2-2u_x\cdot u}{c^2}} \\
&\text{if } \gamma_2 = \frac{\Delta t}{\Delta t'}, \gamma_1 = \frac{\Delta t''}{\Delta t'}
\end{aligned}$$

$$\begin{aligned}
u_x' &= \frac{(u_x-u)}{1-\left(\frac{u_x}{c}\right)^2}\cdot\sqrt{1+\frac{u^2-2u_x\cdot u}{c^2}} \\
&\text{if } \gamma_2 = \frac{\Delta t}{\Delta t'}, \gamma_1 = \frac{\Delta t''}{\Delta t'}
\end{aligned} \tag{III.7}$$

This contradicts Einstein's relation

$$u_x' = \frac{(u_x-u)}{1-\left(\frac{u_x\cdot u}{c^2}\right)} \tag{III.8}$$

and of course this starts in the differential relations that apply to time and space. That is, specifically for this process

$$x = \frac{x'}{\gamma_1} + u\cdot t \tag{III.1}$$

$$\gamma_2 = \frac{t}{t'} = \frac{1}{\sqrt{1-\left(\frac{u_x}{c}\right)^2}} \tag{III.4}$$

$$\gamma_1 = \frac{\sqrt{1+\frac{u^2-2u_x\cdot u}{c^2}}}{\sqrt{1-\left(\frac{u_x}{c}\right)^2}} \tag{III.6}$$

whereas from Special Relativity we know with Lorentz's relations that they apply

$$\begin{aligned} x &= \frac{x'}{\gamma} + u \cdot t \\ t &= \frac{t'}{\gamma} + \frac{u \cdot x}{c^2} \\ \gamma &= \frac{1}{\sqrt{1 - \left(\frac{u}{c}\right)^2}} \end{aligned} \tag{III.9}$$

As we can see the relationships (III.1, III.4, III.6) & (III.9) are not the same and no two are the same.

i). We will see in another part that with **the Dopler paradox** it is clearly shown that the relation for time at least **is wrong and obviously the resulting velocity** is also wrong.

ii). Another method of proving the error of the above relations is explained by the fact that the two frames must be identical in the case where $u = 0$. In this case we will have:

According to figure 5, the relationships in S' will apply

$$\begin{aligned} \Delta x &= \frac{\Delta x'}{\gamma} \\ \Delta t &= \Delta t' \cdot \gamma \\ \gamma &= \frac{1}{\sqrt{1 - \frac{u^2}{c^2}}} \end{aligned} \tag{III.10}$$

It follows from relation III.10 that for the speed apply

$$u'_x = \frac{(u_x)}{1 - \left(\frac{u^2}{c^2}\right)} \tag{III.11}$$

Which concludes in relation

$$u' = \frac{u}{1 - \left(\frac{u^2}{c^2}\right)} \tag{III.12}$$

This is the conclusion of the (III.7)

$$u'_x = \frac{(u_x - u)}{1 - \left(\frac{u_x}{c}\right)^2} \cdot \sqrt{1 + \frac{u^2 - 2u_x \cdot u}{c^2}}$$

If $u = 0 \Rightarrow u'_x = \frac{u_x}{1 - \left(\frac{u_x}{c}\right)^2} \Rightarrow u' = \frac{u}{1 - \left(\frac{u_1}{c}\right)^2}$
that apply for non-moving frame. (III.13)

Because $\begin{matrix} u'_x = u' \\ u_x = u \end{matrix}$ which apply to the same system. On the other hand, if we set $u = 0$ in the equations of Einstein relations, then they give

$$u'_x = \frac{(u_x - u)}{1 - \left(\frac{u_x \cdot u}{c^2}\right)} \text{(III.14)}$$

If $u = 0 \Rightarrow u'_x = u_x \Rightarrow u' = u$
that apply for non-moving frame. (III.14)

Which as we have seen from the relationships (III.14) not valid.

III.II) Four-Vectors(Transformation Minkowski)

The fundamental laws of Physics cannot change their form under spatial rotations, since space is supposed to be isotropic.In the previous chapter we have seen that the time and space coordinates of an event may be regarded as coordinates $(ct,\ x,\ y,\ z)$ of a four-dimensional space-time called Minkowski space, for which we shall use the following short-hand notation

$$(x^\mu) = \left(x^0, x^1, x^2, x^3\right) = (ct, x, y, z); \quad (\mu = 0, 1, 2, 3)$$

Given two events A, B labeled by

$$(x_A^\mu) = (ct_A, x_A, y_A, z_A)\,,\ (x_B^\mu) = (ct_B, x_B, y_B, z_B)\,; \quad (\mu = 0, 1, 2, 3)$$

we may then define a relative position vector of B with respect to A:

$$(\Delta x^\mu) = x_B - x_A = \left(\Delta x^0, \Delta x^1, \Delta x^2, \Delta x^3\right) = (c\Delta t, \Delta x, \Delta y, \Delta z)$$

Using this notation, the Lorentz transformation of the four coordinate differences (Δx^μ) (or their infinitesimal form (dx^μ) is given, in the standard configuration, by (see also (III.1)-(III.4) and (III.6)):

$$x = \frac{x'}{\gamma_1} + u \cdot t \quad \text{(III.1)} \ \Rightarrow$$

$$\Delta x' = \gamma_1(\Delta x - u\Delta t) \tag{III.1'}$$

$$\gamma_2 = \frac{t}{t'} = \sqrt{1 - \left(\frac{u_x}{c}\right)^2} \quad \text{(III.4)} \ \Rightarrow$$

$$\Delta t' = \Delta t \cdot \sqrt{1 - \left(\frac{u_x}{c}\right)^2} \tag{III.4'}$$

$$\gamma_1 = \frac{\sqrt{1 + \frac{u^2 - 2u_x \cdot u}{c^2}}}{\sqrt{1 - \left(\frac{u_x}{c}\right)^2}} \tag{III.6}$$

In summary we write

$$\Lambda\left(u, u_x\right) = \begin{pmatrix} \Delta x'^0 \\ \Delta x'^1 \\ \Delta x'^2 \\ \Delta x'^3 \end{pmatrix} = \begin{pmatrix} \gamma_2 & 0 & 0 & 0 \\ -\gamma_1 \cdot \beta & \gamma_1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} \Delta x^0 \\ \Delta x^1 \\ \Delta x^2 \\ \Delta x^3 \end{pmatrix} \tag{III.7'}$$

where, as usual, $\beta = u/c$. Restricting ourselves to the formal configuration we will temporarily call any set of four quantities that, under which, according to the pre-existing form, is a formal Lorentz transformation, undergoes the transformation in Minkowski space, a temporal four-vector set. We therefore see that ux enters the given matrix (III.7') in addition to the simple velocity. This negates the linearity of Lorentz.

III.III). Squared displacement

We know that for the decomposition of Poincar'e transformations, and since temporal and spatial translations leave all the - and d-terms unchanged, while rotations preserve the spatial and temporal parts of (III.8) and separately, these two identities hold even under Poincar'e transforma-tions, i.e. between any two inertial coordinate systems

$$\begin{aligned} c^2\Delta t'^2 - \Delta x'^2 - \Delta y'^2 - \Delta z^2 &= c^2\Delta t^2 - \Delta x^2 - \Delta y^2 - \Delta z^2 \\ c^2 t'^2 - x'^2 - y'^2 - z'^2 &= c^2 t^2 - x^2 - y^2 - z^2 \end{aligned} \tag{III.8}$$

Thus, collecting our results, we have found the standard Lorentz transformation Equations

$$x' = \gamma(x - vt), \quad y' = y, \quad z' = z, \quad t' = \gamma\left(t - vx/c^2\right), \tag{III.9}$$

verify the relationship above as we know. Since in the above derivation we have used Einstein's postulates only specifically, we must still check whether the transformation (III.9) respects them generally. First, the linearity of the transformation implies that any uniformly moving point transforms into a uniformly moving point. This, incidentally, recovers the invariance of Newton's first law, but, of course, it also applies to light signals.

$$c^2 dt'^2 - dx'^2 - dy'^2 - dz'^2 = c^2 dt^2 - dx^2 - dy^2 - dz^2. \tag{III.10}$$

This identity, therefore, succinctly characterizes the Poincar'e transformations, just as the invariant differential form (III.8) characterizes the rotations, displacements and reintersections of the Euclidean 3space. The joint value of the two quadratic forms in (III.10) is defined as the square of the displacement ΔS between the two considered events(III.11):

$$\begin{aligned} dr^2 &= dx^2 + dy^2 + dz^2 \\ \Delta s^2 &:= c^2\Delta t^2 - \Delta x^2 - \Delta y^2 - \Delta z^2 \end{aligned} \tag{III.11}$$

Obviously it can be positive, negative or zero, and thus should not be taken as the square of an ordinary number. It is, in fact, as we shall see later, the square of a 4 vector, hence the bold letters. The square root of its absolute value, written Δs, is often called an interval.

However, with the new transformations we have introduced, equality for relations (III.8) does not hold, so all these transformations are overturned.

$$dx' = \frac{\sqrt{1 + \frac{u^2 - 2u_x \cdot u}{c^2}}}{\sqrt{1 - \left(\frac{u_x}{c}\right)^2}}(dx - udt) \tag{III.1'}$$

$$dt' = dt \cdot \sqrt{1 - \left(\frac{u_x}{c}\right)^2} \tag{III.4'}$$

But we have

$$c^2dt'^2 - dx'^2 - \left(c^2dt^2 - dx^2\right) =$$
$$dx^2 - dt^2u_x^2 - \frac{(dx - dt\cdot u)^2\left(c^2 + u\left(u - 2u_x\right)\right)}{c^2 - u_x^2} \neq 0 \qquad \text{(III.5')}$$

Therefore

$$c^2dt'^2 - dx'^2 - dy'^2 - dz'^2 \neq c^2dt^2 - dx^2 - dy^2 - dz^2 \Rightarrow$$
$$c^2dt'^2 - dx'^2 \neq c^2dt^2 - dx^2, \text{ if } dy' = dy, dz' = dz \qquad \text{(III.6')}$$

We, therefore, see that equality does not hold, and this is a problem that overturns the validity of the relation in General Relativity. We will have possible corrections there as well, something that needs to be completed and worked out on another basis of the possibilities of these relations.

IV. Doppler effect Paradox

We have a spherical wave transmitter experiment and a receiver that receives and observes [11, 12, 14]. We consider 2 cases. In the first case, the receiver is in the ether, while the transmitter moves along a line. In the second case, the transmitter is in the ether and the receiver is moving along a line.

Case 1. The receiver is stationary in the ether.

The source moves along the x-axis of the system U, which is connected to the ether, with a velocity $v \leq c$ and emits light pulses with frequency fs'. Figure 6 shows two points A and B where the source has emitted pulses. The first pulse is sent at time tS' and the other at time $ts' + Ts'$ (in the system of the source). In the figure, two circles corresponding to pulses show the motion.

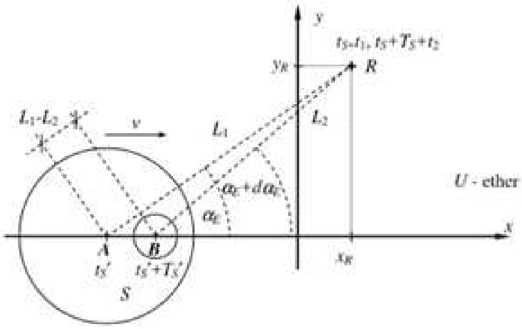

Figure 6:

The frequencies that will be emitted will be

$$f_R = f_s' \frac{\sqrt{1 - \frac{v^2}{c^2}}}{1 - \frac{v}{c}\cos\alpha_E}; \alpha_E \in (0 \div \pi) \qquad \text{(IV.1)}$$

Angle α_E is the angle seen from the ether.

Case 2. The source in the ether

The source is stationary in the ether and emits light pulses with frequency fs. Then the receiver is moving along the x-axis of the coordinate system U, which is connected to the ether, at a speed of $v \leq c$. Figure 7 shows two points A and B, at which a receiver receives the pulses. The first impulse reaches the receiver in time t_R and the other in time $t_R + T_R$ (measured in the ether). Two circles in the figure correspond to the two pulses.

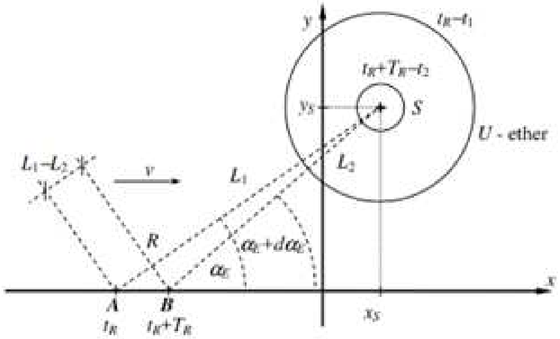

Figure 7:

Finally for the measured frequency we get

$$f_R{}' = f_s \frac{1 + \frac{v}{c}\cos\alpha_E}{\sqrt{1 - \frac{v^2}{c^2}}}; \alpha_E \in (0 \div \pi) \tag{IV.2}$$

Angle α_E is the angle seen from the ether.

If we multiply relations IV.1 and IV.2 we obtain the relation

$$f_R \cdot f_R' = f_s \cdot f_s' \frac{1 + \frac{v}{c}\cos\alpha_E}{1 - \frac{v}{c}\cos\alpha_E}; \alpha_E \in (0 \div \pi) \tag{IV.3}$$

because he has to $f_R' = f_s'$ follow

$$f_R = f_s \frac{1 + \frac{v}{c}\cos\alpha_E}{1 - \frac{v}{c}\cos\alpha_E}; \alpha_E \in (0 \div \pi) \tag{IV.4}$$

But as we can see, in order to obtain both the $f_R = f_s$ equal must

$$1 = \frac{1 + \frac{v}{c}\cos\alpha_E}{1 - \frac{v}{c}\cos\alpha_E}, \alpha_E \in (0 \div \pi) \Rightarrow \alpha_E = \frac{\pi}{2} \text{ or } \alpha_E = \frac{3 \cdot \pi}{2} \tag{IV.5}$$

But that is a special case, because we want it to apply generally. This means that we have a relation for Einstein's time and especially for Lorentz's time which cannot be correct.

If we check the times with the theory of relativity with the formulas we get, Similarly we will have the frequency for the S' frame

$$\begin{aligned} t' &= \gamma\left(t - v \cdot x/c^2\right) \Rightarrow \\ t' &= \gamma(t - v \cdot t/c) \Rightarrow \end{aligned}$$

$$t' = \frac{(t - v \cdot t \cdot \cos\alpha/c)}{\sqrt{1 - \frac{v^2}{c^2}}} \Rightarrow$$

$$t' = t \cdot \frac{(1 - v \cdot \cos\alpha/c)}{\sqrt{1 - \frac{v^2}{c^2}}} \quad \text{(IV.6)} \Rightarrow$$

$$f' = f \cdot \frac{\sqrt{1 - \frac{v^2}{c^2}}}{(1 - v \cdot \cos\alpha/c)} \quad \text{(IV.6')} \quad \text{and} \quad f = f' \cdot \frac{1 - v \cdot \cos\alpha/c)}{\sqrt{1 - \frac{v^2}{c^2}}} \quad \text{(IV.6")}$$

Similarly we will have the frequency for the S frame

$$t = \gamma\left(t' + v \cdot x'/c^2\right) \Rightarrow$$

$$t = \gamma\left(t' + v \cdot t'/c\right) \Rightarrow$$

$$t = \frac{(t' + v \cdot t' \cdot \cos\alpha/c)}{\sqrt{1 - \frac{v^2}{c^2}}} \Rightarrow$$

$$t = t' \cdot \frac{(1 + v \cdot \cos\alpha/c)}{\sqrt{1 - \frac{v^2}{c^2}}} \quad \text{(IV.7)}$$

$$f = f' \cdot \frac{\sqrt{1 - \frac{v^2}{c^2}}}{(1 + v \cdot \cos\alpha/c)} \quad \text{(IV.7')} \quad \text{and} \quad f' = f \cdot \frac{(1 + v \cdot \cos\alpha/c)}{\sqrt{1 - \frac{v^2}{c^2}}} \quad \text{(IV.7")}$$

Therefore all the equations mentioned in the Dopler Paradox are derived from the Lorentz equations.

i). But what actually happens in STR

The observer and the source speak on the same phenomenon. The observer says that if the source generates a light wave with frequency f_z, then he has to measure the wave with frequency f_o expressed by dependence (IV.8).

From VI.6' apply

$$f' = f \cdot \frac{\sqrt{1 - \frac{v^2}{c^2}}}{(1 - v \cdot \cos\alpha/c)} \Rightarrow$$

$$f_0 = f_z \cdot \frac{\sqrt{1 - \frac{v^2}{c^2}}}{(1 - v \cdot \cos\alpha/c)} \tag{IV.8}$$

The source, however, claims that since it generates the light wave with frequency f_z, the observer has to measure the wave with frequency f_o expressed by the dependence (IV.9).

$$f' = f \cdot \frac{(1 + v \cdot \cos\alpha/c)}{\sqrt{1 - \frac{v^2}{c^2}}} \Rightarrow$$

$$f_z = f_0 \cdot \frac{(1 + v \cdot \cos\alpha/c)}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{IV.9}$$

Dependencies (IV.8) and (IV.9) are different. With two correct reasonings, two different formulas for the Doppler effect we derived. This is another obvious evidence that STR is selfcontradictory. If we consider this paradox and compare the formulas for frequency contraction with those derived in STE, it appears that formula (IV.8) expresses the frequency contraction produced in the system and seen in the ether. In contrast, formula (IV.9) expresses the contraction of the frequency generated in the ether and seen in the system. To properly determine the Doppler effect, these two formulas must be combined into one, as shown in STE. That is, first the frequency from the first system must be converted to the ether, and then this new frequency from the ether to another system. In STR, this cannot be observed because it has been incorrectly assumed that all inertial reference frames are equivalent, which does not take into account the existence of a global reference frame (the aether). The analysis of the Doppler effect paradox entails a similar observation to the analysis of the paradox of clock readings. If calculations based on the reference system are performed in STR, then this reference system is by definition the aether.

It is therefore obvious that the times given by Lorentz cannot be valid and this was proved in the previous chapter and furthermore, the formulas for space are also not valid.

ii). Undoing of the paradox

So we come to prove what happens to the paradox if it continues to be a paradox with the formulas given in the previous chapter. In this particular topic we are interested in whether the use of the time formula, shown in SS' system, negates the paradox.

Indeed the time for the SS' frame system has been calculated

$$\gamma_2 = \frac{t}{t'} = \frac{1}{\sqrt{1-\left(\frac{u_x}{c}\right)^2}} \tag{III.4}$$

we have for the frequency 2 types

$$t = \frac{t'}{\sqrt{1-\left(\frac{u_x}{c}\right)^2}} \Rightarrow$$

$$f = f'\sqrt{1-\left(\frac{u_x}{c}\right)^2} \tag{IV.10}$$

$$f' = f\frac{1}{\sqrt{1-\left(\frac{u_x}{c}\right)^2}} \tag{IV.11}$$

we have for the frequency 2 formulas according to section (i), and by the same logic we get

a) The source, however, claims that since it generates the light wave with frequency f_z, the observer has to measure the wave with frequency f_o expressed by the dependence (IV.12).

$$f_o = f_z\sqrt{1-\left(\frac{u_x}{c}\right)^2} \Rightarrow$$

$$f_o = f_z\sqrt{1-\left(\frac{+u\cdot\cos\alpha}{c}\right)^2} \Rightarrow$$

$$f_o = f_z\sqrt{1-\left(\frac{u\cdot\cos\alpha}{c}\right)^2} \tag{IV.12}$$

b) The observer says that if the source generates a light wave with frequency f_z, then he has to measure the wave with frequency f_o expressed by dependence (IV.13).

$$
\begin{aligned}
f_z &= f_0 \frac{1}{\sqrt{1-\left(\frac{u_x}{c}\right)^2}} \Rightarrow \\
f_z &= f_0 \frac{1}{\sqrt{1-\left(\frac{-u\cdot\cos\alpha}{c}\right)^2}} \Rightarrow \\
f_z &= f_0 \frac{1}{\sqrt{1-\left(\frac{u\cdot\cos\alpha}{c}\right)^2}} \qquad \text{(IV.13)}
\end{aligned}
$$

if we substitute the first equation IV.12 into to the second IV.13, then follow equality results. **So the Dopler paradox is negated, therefore the relation of time is acceptable and of course space.**

iii) The analysis applies Doppler shifts to the Fourier time sine series. It shows if $K = f'/$ (frequency ratio of the shift, f' the shifted frequency), then the value of the series at time=t occurs in the shifted series at time $= t/K$. The original series could be the number of photons in area of a beam with encoded information. Therefore, the number of observed photons and information have the same resultant Doppler shift as frequency. Resultant is total effect of axial, transverse and gravitational shifts. Also the mass and energy of each photon also has the same shift. **That agrees with Planck's and Schrodinger's equations but not Einstein.** From the above, if there is a red shift of information, energy and mass in the beam is compressed in time and space (space $= ct$). Time travel of mass or energy is a violation of the conservation laws. If the information is dilated, it is going into the future from the past. If information is compressed it coming from the future it would not have been in the past yet. But the uncertainty principal, other noise and lack of energy in the source for generating photons of very high frequency, limits time travel to small values. That raises the question: is the mass and energy doing the same time travel as information, or is that energy and mass balance coming from kinetic energy going to or from the relative velocity of the observer and the source. Paradox of Information Time Travel [7]: If someone has information about an event someone can change because it is not completely determined from the past. If it is undesirable for him, he would do whatever he can to negate (reverse) it. Then the information would not have come in the first place if there was only one future. That seems to indicate either Doppler shifts are very noisy or there is lots of futures (time having more than one dimension). But the uncertainty principal, other noise and lack of energy in source for generating photons of very high frequency, limits time travel to small values. The law of conservation of energy and mass does not allow time travel of mass or energy. The second law of thermodynamics does not allow compression of energy without putting more or at least the same amount energy as work in. If we substitute the first equation IV.12 into to the second IV.13, then follow equality results. So the Dopler paradox is negated, therefore the relation of time is acceptable and of course space. **We refer to the initial relationships for the SS' system.**

V. Velocity and Acceleration Transformations Relative and mutual velocity

Once again, let us consider two inertial frames S and S' in standard configuration. Let u be the instantaneous vector velocity in S of a particle or simply of a geometrical point (so as not to exclude the possibility $u > c$). We wish to find the velocity u of this point in S'. As in classical kinematics, we define

$$u = (u_x,\ u_y,\ u_z) = (dx/dt,\ dy/dt,\ dz/dt) \qquad \text{(V.1)}$$

$$u' = \left(u'_x,\ u'_y,\ u'_z\right) = (dx'/dt',\ dy'/dt',\ dz'/dt') \qquad \text{(V.2)}$$

Substituting from (II1.1, III.4, III.6) into (V.2), dividing each numerator and denominator by dt, and comparing with (III.1), now immediately yields the velocity transformat-ion formulae:

$$u_x' = \frac{(u_x - u)}{1 - \left(\frac{u_x}{c}\right)^2} \cdot \sqrt{1 + \frac{u^2 - 2u_x \cdot u}{c^2}} \tag{V.3}$$

$$u_y' = \frac{dy'}{dt'} = \frac{dy}{dt\sqrt{1 - \left(\frac{u_x}{c}\right)^2}} = \frac{dy/dt}{\sqrt{1 - \left(\frac{u_x}{c}\right)^2}} = \frac{u_y}{\sqrt{1 - \left(\frac{u_x}{c}\right)^2}} \tag{V.4}$$

$$u_z' = \frac{dz'}{dt'} = \frac{dz}{dt\sqrt{1 - \left(\frac{u_x}{c}\right)^2}} = \frac{dz/dt}{\sqrt{1 - \left(\frac{u_x}{c}\right)^2}} = \frac{u_z}{\sqrt{1 - \left(\frac{u_x}{c}\right)^2}} \tag{V.5}$$

No assumption as to the uniformity of u was made, and these formulae apply equally to the instantaneous velocity in a non-uniform motion. To do an inversion we must first calculate u_x from u_x' and (V.3), and solve the equation (V.3) we take 4 solutions i.e.

$$\begin{aligned}
{}_1u_x = &-\frac{c^2u}{2 \cdot (u_x')^2} + \frac{cu\sqrt{c^2 + 4 \cdot (u_x')^2}}{2 \cdot (u_x')^2} - \\
&\frac{\sqrt{2c^2 + \frac{c^4u^2}{(u_x')^4} + \frac{c^4}{(u_x')^2} + \frac{3c^2u^2}{(u_x')^2} - \frac{4c^3}{\sqrt{c^2+4(u_x')^2}} - \frac{4cu^2}{\sqrt{c^2+4(u_x')^2}} - \frac{c^5u^2}{(u_x')^4\sqrt{c^2+4(u_x')^2}} - \frac{c^5}{(u_x')^2\sqrt{c^2+4(u_x')^2}} - \frac{5c^3u^2}{(u_x')^2\sqrt{c^2+4(u_x')^2}}}}{\sqrt{2}} \\
&= f_1(u, u_x')
\end{aligned}$$

$$\begin{aligned}
{}_2u_x = &-\frac{c^2u}{2 \cdot (u_x')^2} + \frac{cu\sqrt{c^2 + 4 \cdot (u_x')^2}}{2 \cdot (u_x')^2} + \\
&\frac{\sqrt{2c^2 + \frac{c^4u^2}{(u_x')^4} + \frac{c^4}{(u_x')^2} + \frac{3c^2u^2}{(u_x')^2} - \frac{4c^3}{\sqrt{c^2+4(u_x')^2}} - \frac{4cu^2}{\sqrt{c^2+4(u_x')^2}} - \frac{c^5u^2}{(u_x')^4\sqrt{c^2+4(u_x')^2}} - \frac{c^5}{(u_x')^2\sqrt{c^2+4(u_x')^2}} - \frac{5c^3u^2}{(u_x')^2\sqrt{c^2+4(u_x')^2}}}}{\sqrt{2}} \\
&= f_2(u, u_x')
\end{aligned}$$

$$\begin{aligned}
{}_3u_x = &-\frac{c^2u}{2 \cdot (u_x')^2} - \frac{cu\sqrt{c^2 + 4 \cdot (u_x')^2}}{2 \cdot (u_x')^2} - \\
&\frac{\sqrt{2c^2 + \frac{c^4u^2}{(u_x')^4} + \frac{c^4}{(u_x')^2} + \frac{3c^2u^2}{(u_x')^2} + \frac{4c^3}{\sqrt{c^2+4(u_x')^2}} + \frac{4cu^2}{\sqrt{c^2+4(u_x')^2}} + \frac{c^5u^2}{(u_x')^4\sqrt{c^2+4(u_x')^2}} + \frac{c^5}{(u_x')^2\sqrt{c^2+4(u_x')^2}} + \frac{5c^3u^2}{(u_x')^2\sqrt{c^2+4(u_x')^2}}}}{\sqrt{2}} \\
&= f_3(u, u_x')
\end{aligned}$$

$$\begin{aligned}
{}_4u_x = &-\frac{c^2u}{2 \cdot (u_x')^2} - \frac{cu\sqrt{c^2 + 4 \cdot (u_x')^2}}{2 \cdot (u_x')^2} + \\
&\frac{\sqrt{2c^2 + \frac{c^4u^2}{(u_x')^4} + \frac{c^4}{(u_x')^2} + \frac{3c^2u^2}{(u_x')^2} + \frac{4c^3}{\sqrt{c^2+4(u_x')^2}} + \frac{4cu^2}{\sqrt{c^2+4(u_x')^2}} + \frac{c^5u^2}{(u_x')^4\sqrt{c^2+4(u_x')^2}} + \frac{c^5}{(u_x')^2\sqrt{c^2+4(u_x')^2}} + \frac{5c^3u^2}{(u_x')^2\sqrt{c^2+4(u_x')^2}}}}{\sqrt{2}} \\
&= f_4(u, u_x')
\end{aligned}$$

i.e we will have briefly the relations

$$ {}_{i}u_x = f_i\left(u, u'_x\right), i = 1,2,3,4, f_i\left(u, u'_x\right) \in R \tag{V.6} $$

For the other speeds we will have the relations

$$ u'_y = \frac{u_y}{\sqrt{1-\left(\frac{u_x}{c}\right)^2}} \Rightarrow $$

$$ u_y = u'_y \cdot \sqrt{1-\left(\frac{u_x}{c}\right)^2} \Rightarrow $$

$$ u_y = u'_y \cdot \sqrt{1-\left(\frac{f_i\left(u, u'_x\right)}{c}\right)^2},\ i = 1,2,3,4 \tag{V.7} $$

$$ u'_z = \frac{u_z}{\sqrt{1-\left(\frac{u_x}{c}\right)^2 \Rightarrow}} $$

$$ u_z = u'_z \cdot \sqrt{1-\left(\frac{u_x}{c}\right)^2} \Rightarrow $$

$$ u_z = u'_z \cdot \sqrt{1-\left(\frac{f_i\left(u, u'_x\right)}{c}\right)^2},\ i = 1,2,3,4 \tag{V.8} $$

In the same way, we can obtain the transformations of acceleration $a_x = \frac{du_x}{dt}$, $a'_x = \frac{du'_x}{dt'}$ becomes by Differentiating Egs. (V.6, V.7, V.8)

$$ a'_x = \frac{du'_x}{dt'} = $$

$$ \frac{du_x/dt}{\sqrt{1-\left(\frac{u_x}{c}\right)^2}} \left(-\frac{u\left(-u+u_x\right)}{c^2\left(1-\left(\frac{u_x}{c}\right)^2\right)\sqrt{1+\left(\frac{u^2-2uu_x}{c^2}\right)}} + \frac{\sqrt{1+\left(\frac{u^2-2uu_x}{c^2}\right)}}{\left(1-\left(\frac{u_x}{c}\right)^2\right)} + \frac{2u_x\left(-u+u_x\right)\sqrt{1+\left(\frac{u^2-2uu_x}{c^2}\right)}}{c^2\left(1-\left(\frac{u_x}{c}\right)^2\right)^2} \right) \Rightarrow $$

$$ a'_x = \frac{\alpha_x}{\sqrt{1-\left(\frac{u_x}{c}\right)^2}} \left(-\frac{u\left(-u+u_x\right)}{c^2\left(1-\left(\frac{u_x}{c}\right)^2\right)\sqrt{1+\left(\frac{u^2-2uu_x}{c^2}\right)}} + \frac{\sqrt{1+\left(\frac{u^2-2uu_x}{c^2}\right)}}{\left(1-\left(\frac{u_x}{c}\right)^2\right)} + \frac{2u_x\left(-u+u_x\right)\sqrt{1+\left(\frac{u^2-2uu_x}{c^2}\right)}}{c^2\left(1-\left(\frac{u_x}{c}\right)^2\right)^2} \right) \tag{V.9} $$

$$ a'_y = \frac{du'_y}{dt'} = \frac{\frac{du_y}{\sqrt{1-\left(\frac{u_x}{c}\right)^2}}}{dt\sqrt{1-\left(\frac{u_x}{c}\right)^2}} = \frac{du_y/dt}{1-\left(\frac{u_x}{c}\right)^2} = \frac{\alpha_y}{1-\left(\frac{u_x}{c}\right)^2}(V.10) \tag{V.10} $$

$$ a'_z = \frac{du'_z}{dt'} = \frac{\frac{du_z}{\sqrt{1-\left(\frac{u_x}{c}\right)^2}}}{dt\sqrt{1-\left(\frac{u_x}{c}\right)^2}} = \frac{du_z/dt}{1-\left(\frac{u_x}{c}\right)^2} = \frac{\alpha_z}{1-\left(\frac{u_x}{c}\right)^2}(V.11) \tag{V.11} $$

VI. Energy, Light

We have spent all our time so far discussing how space-time coordinate measurements are transformed between inertial frames in such a way that there is a global velocity limit. We need to see that we can write a relativistic dynamics scheme that satisfies axiom 1 of relativity that the relative velocity between inertial frames is constant. In the notation here we distinguish 2 states. One concerns the laboratory as we will call it with $u = 0$ relative velocity of inertial frames and the second more with a relative velocity other than zero. We notice with the analysis we will see the relation $E = m \cdot c^2$ is a relation that does not correspond to the total reality that connects the situation in the laboratory. It is part of the proof and therefore we cannot accept it if the whole is part of it. So we will prove where the problem lies and we see how it is corrected.

Let's separate the 2 situations and see where the error started

VI.I. But, using the equation of motion, we can calculate $E_\kappa = W_{12}$ in another way,

$$E_\kappa = \int_0^u m \cdot \frac{du'}{dt'} \cdot dx \tag{VI.1}$$

From relation (III.12) we have

$$u' = \frac{u}{1 - \left(\frac{u^2}{c^2}\right)} \cdot \text{(III.12)}$$

If we find the first derivative in this relation we get

$$du' = \frac{1 + \left(\frac{u^2}{c^2}\right)}{1 - \left(\frac{u^2}{c^2}\right)} du \tag{VI.2}$$

At this point, as we shall see, relativity theory does not use this relation but simply assumes that the relation

$$du' = \frac{du}{1 - \left(\frac{u^2}{c^2}\right)} \tag{VI.3}$$

It is also known that the relation for the laboratory

$$dt' = dt\sqrt{1 - \left(\frac{u}{c}\right)^2}$$

which is clearly incorrect. So if we continue to find the kinetic energy from the relation

$$E_k = \int_0^u m \cdot \frac{d'u}{dt'} \cdot dx \Rightarrow$$

$$\int_0^u m \cdot \frac{du}{\left(1 - \left(\frac{u^2}{c^2}\right)\right) \cdot \left(1 - \left(\frac{u^2}{c^2}\right)\right)^{1/2}} \cdot \frac{dx}{dt} = \int_0^u m \cdot \frac{u \cdot du}{\left(1 - \left(\frac{u^2}{c^2}\right)\right)^{3/2}} = \frac{m \cdot c^2}{\left(1 - \left(\frac{u^2}{c^2}\right)\right)^{1/2}} - m \cdot c^2 \Rightarrow$$

$$E_k = \frac{m \cdot c^2}{\left(1 - \left(\frac{u^2}{c^2}\right)\right)^{1/2}} - m \cdot c^2 \tag{VI.4}$$

This is the relation (VI.4) proposed by Einstein's relativity for energy and let's see the other explanation we can give using the correct relation.

VI.II.a). In this case, we take the correct derivative of u' in place of the non-normal relation growth given in the theory of special relativity. Using the new procedure we obtain the first derivative in relation to speed u', and in this way, we obtain the correct solution for the kinetic energy and we have therefore

$$E_\kappa = \int_0^u m \cdot \frac{du'}{dt'} \cdot dx \Rightarrow$$

$$\int_0^u m \cdot \frac{\left(1 + \left(\frac{u^2}{c^2}\right)\right) du}{\left(1 - \left(\frac{u^2}{c^2}\right)\right) \cdot \left(1 - \left(\frac{u^2}{c^2}\right)\right)^{1/2}} \cdot \frac{dx}{dt} = \int_0^u m \cdot \frac{u \cdot \left(1 + \left(\frac{u^2}{c^2}\right)\right) du}{\left(1 - \left(\frac{u^2}{c^2}\right)\right)^{3/2}} =$$

$$E_k = m \cdot c^2 \left(\frac{4}{3} + \frac{2 \cdot u^2/c^2}{\left(1 - \left(\frac{u^2}{c^2}\right)\right)^{3/2}} + \frac{1}{\left(1 - \left(\frac{u^2}{c^2}\right)\right)^{3/2}} \right) - m \cdot c^2 \left(\frac{4/3}{\left(1 - \left(\frac{u^2}{c^2}\right)\right)^{3/2}} + 1 \right) \tag{VI.5}$$

If we compare relations (VI.4 & VI.5) we will notice that VI.5 contains VI.4 and therefore they are not equal. Therefore the correct one as a result of E_k is the correct one.

VI.II.b). Another expression for kinetic energy E_k is of the form

$$E_\kappa = \int_0^u m \cdot \frac{du'}{dt'} \cdot dx \Rightarrow$$

$$\int_0^u m \cdot \frac{\left(1 + \left(\frac{u^2}{c^2}\right)\right) du}{\left(1 - \left(\frac{u^2}{c^2}\right)\right) \cdot \left(1 - \left(\frac{u^2}{c^2}\right)\right)^{1/2}} \cdot \frac{dx}{dt} = \int_0^u m \cdot \frac{u \cdot \left(1 + \left(\frac{u^2}{c^2}\right)\right) du}{\left(1 - \left(\frac{u^2}{c^2}\right)\right)^{3/2}} =$$

$$E_\kappa = m \cdot c^2 \left(\frac{1}{3} + \frac{u^2/c^2}{\left(1 - \left(\frac{u^2}{c^2}\right)\right)^{3/2}} \right) - m \cdot c^2 \left(\frac{1/3}{\left(1 - \left(\frac{u^2}{c^2}\right)\right)^{3/2}} \right) \tag{VI.6}$$

This relation is considered the shortest and most comprehensive. It is therefore divided into **Total Energy** and **Rest Energy** as mentioned in Relativity,

Because In general, it is true that $E_k = E_o - E_R$ and therefore apply from (VI.6) that

$$E_O = m \cdot c^2 \left(\frac{1}{3} + \frac{u^2/c^2}{\left(1 - \left(\frac{u^2}{c^2}\right)\right)^{3/2}} \right) \tag{VI.7}$$

$$E_R = m \cdot c^2 \left(\frac{1/3}{\left(1 - \left(\frac{u^2}{c^2}\right)\right)^{3/2}} \right) \tag{VI.8}$$

If we now develop the relation (VI.6) in order, we find that

$$E_\kappa = m \cdot c^2 \left(\frac{1}{3} + \frac{u^2/c^2}{\left(1 - \left(\frac{u^2}{c^2}\right)\right)^{3/2}} \right) - m \cdot c^2 \left(\frac{1/3}{\left(1 - \left(\frac{u^2}{c^2}\right)\right)^{3/2}} \right) = m \cdot c^2 \left(\frac{1}{2} \frac{u^2}{c^2} + \frac{7u^4}{8c^4} + O\left(u^6\right) \right) =$$

$$\approx m \cdot \left(\frac{1}{2} \cdot u^2 \right), \ u << c$$

We observe that it converges to Newton's physics, and therefore we are satisfied with this form.

VII. Relative Multiple moving Frames

As a continuation of the chapter we consider the case in general for more than 1 moving system between the fixed S and S'. First we assume a frame S_1 moving with velocity u_1, such that $u_1 \leq u_2$ where u_2 is the frames $S_1,\ S'$ which move along the x-axis. Taking also into account the other two coordinates $y,\ z$, which are not transformed if the two inertial frames are in the normal configuration. Each point in spacetime defines an event occurring at a point in the coordinate space $x,\ y,\ z$, at a time t, and is characterized by the four coordinates $t,\ x,\ y,\ z$. In three-dimensional Euclidean space a shift of the coordinate axes implies a transformation in the $x,\ y,\ z$ components of the relative position vector between two points, which however defines their respective quadratic distance. We consider 3 coordinate systems S with $(x,\ y,\ z,\ t)$, S_1 with $(x_1,\ y_1,\ z_1,\ t'')$ and S' with $(x',\ y',\ z',\ t')$ such that S' moves with a constant velocity u_2 (uniformly) relative to S_1 and S_1 frame with u_1 velosity relative to S. If we consider a mirror system as in the Michaelson experiment, we want to calculate the intervals and times in each system separately. Thus we have two events let A and B, in this case, were the emission of a light ray at time $t = t' = 0$ and as shown in figure 8, the passage of the ray generally to a point A with coordinates $(x,\ y,\ z,\ t)$ for S, $(x',\ y',\ z',\ t')$ for S' and $(x_1,\ y_1,\ z_1, t'')$ for S_1 respectively. Now assume that S' is moving with velocity u_2 relative S_1, and assume that the light ray arrives at the upper mirror at time t of S and t' for S' and t'' for S_1. The corresponding intervals will be x and x and x_1 for each frame respectively.

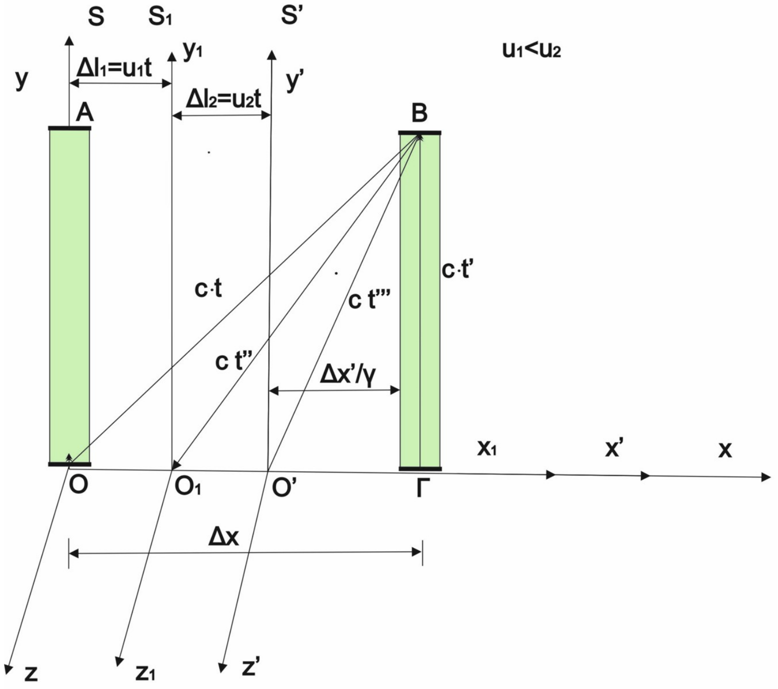

Figure 8:

According to the theory mentioned in section III (Relative moving systems frames S' to stationary S) in a similar way will hold

I). For the frame property S

$$u'_x = \frac{(u_x - (u_1 + u_2))}{1 - \left(\frac{u_x}{c}\right)^2} \cdot \sqrt{1 + \frac{(u_1 + u_2)^2 - 2u_x \cdot (u_1 + u_2)}{c^2}} \tag{VII.1}$$

I. To generalize the relations for n moving frames, except for frame S', with $n \geq 3$ we will take the relations

$$u'_x = \frac{\left(u_x - \sum_{i=1}^{n+1} u_i\right)}{1 - \left(\frac{u_x}{c}\right)^2} \cdot \sqrt{1 + \frac{\left(\sum_{i=1}^{n+1} u_i\right)^2 - 2u_x \cdot \left(\sum_{i=1}^{n+1} u_i\right)\Big)}{c^2}} \tag{VII.2}$$

II). For the moving frame S_j

$$u'_{x_1} = \frac{(u_{x_j} - (u_j))}{1 - \left(\frac{u_{x_1}}{c}\right)^2} \cdot \sqrt{1 + \frac{(u_1)^2 - 2u_{x_1} \cdot (u_1)}{c^2}} \tag{VII.3}$$

where $1 \leq j \leq n$

To generalize the relations for n moving frames, except for frame S', with $n \geq 2$ we will take the relation

$$u'_{x_j} = \frac{\left(u_{x_j} - \left(\sum_{i=j}^{n+1} u_{i+1}\right)\right)}{1 - \left(\frac{u_{x_j}}{c}\right)^2} \cdot \sqrt{1 + \frac{\left(\sum_{i=j}^{n+1} u_{i+1}\right)^2 - 2u_{x_j} \cdot \left(\sum_{i=j}^{n+1} u_{i+1}\right)}{c^2}} \tag{VII.4}$$

where $1 \leq j \leq n$

III). Finding the relationship between u_{x_j} of the moving frames and u_x of the stationary frame.

To connect each moving frame to the fixed one we have to go back to the original relation of relativistic intervals. So according to this logic we will have the relationships

$$\frac{dx'}{\gamma_j} = (x_j - u_{j+1} \cdot t) \tag{VII.5}$$

$$\frac{dx'}{\gamma} = \left(x - \sum_{i=1}^{n} u_i \cdot t\right) \tag{VII.6}$$

$$1 \leq j \leq n$$

From the previous relations it follows that

$$\frac{dx'}{\gamma_j} = \left(u_{x_j} - u_{j+1} \cdot t\right) \tag{VII.7}$$

$$\frac{dx'}{\gamma} = \left(u_x - \sum_{i=j}^{n} u_i\right) \tag{VII.8}$$

$$1 \leq j \leq n$$

Following this relationship

$$\frac{\gamma}{\gamma_j} = \frac{\left(u_{x_j} - \sum_{i=j}^{n+1} u_{j+1}\right)}{\left(u_x - \sum_{i=1}^{n+1} u_i\right)} \tag{VII.9}$$

where $\gamma_j = \frac{\sqrt{1+\frac{\left(\sum_{i=j}^{n+1} u_{i+1}\right)^2 - 2u_{x_j}\cdot\left(\sum_{i=j}^{n+1} u_{i+1}\right)}{c^2}}}{\sqrt{1-\left(\frac{u_{x_j}}{c}\right)^2}}, \gamma = \frac{\sqrt{\left(\sum_{i=1}^{n+1} u_i\right)^2 - 2u_x\cdot\left(\sum_{i=1}^{n+1} u_i\right)}}{\sqrt{1-\left(\frac{u_x}{c}\right)^2}},\ 1\leq j\leq n$

n is number of moving frames

With the final relation (VIII.9) we always calculate the speed u_{x_j} for $1 \leq j \leq n$, as a function of u_x. This procedure is necessary to determine always the intermediate speeds u_{x_j} of the moving frames, in relation to the speed u_x calculated by the fixed frame, because they are generally indeterminate.

VIII. Fractional Transformed Special Relativity

Fractional calculus is a natural tool for describing relativistic phenomena in pseudo-Euclidean space-time. Fractional calculus is one of the most important factors that could be used Fractional modified special relativity as we will present it. We obtain fractional generalized relation for time expansion but also length contraction.

1. Fractional calculus: Riemann-Liouvill integral operator

Riemann tried to approach fractional calculus through the process of integration, i.e. the representation of integration in a way that allows the extension of the order of integration beyond the natural numbers.

This approach was as follows. For any natural number n the n-th integral of the function f in the interval $[0,\ x]$ is given by

$$\begin{aligned} D^{-n}f(x) &= \int_0^x \int_0^{t_n} \int_0^{t_{n-1}} \ldots \int_0^{t_2} f(t)dt_1 dt_2 \ldots dt_{n-1}dt_n + \\ &+ c_1x^{n-1} + c_2x^{n-2} + \ldots + c_{n-1}x + c_n \end{aligned} \tag{1.VIII}$$

Where D^{-n} symbolizes n successive integrations. But we know from the classical integral calculus that

$$\int_0^x \int_0^{t_n} \int_0^{t_{n-1}} \ldots \int_0^{t_2} f(t)dt_1 dt_2 \ldots dt_{n-1}dt_n = \frac{1}{(n-1)!}\int_0^x (x-t)^{n-1}f(t)dt \tag{2.VIII}$$

Therefore the relationship (1.VIII) is done at

$$D^{-n}f(x) = \frac{1}{(n-1)!}\int_0^x (x-t)^{n-1}f(t)dt + \sum_{k=1}^{n} c_k x^{n-k} \tag{3.VIII}$$

More specifically, assuming all integration constants are zero, (3.VIII) is written

$$D^{-n}f(x) = \frac{1}{\Gamma(n)}\int_0^x (x-t)^{n-1}f(t)dt \tag{4.VIII}$$

Especially for a polynomial function we will generally have that for the fractional Integral apply

$$D^{-P}x^a = \frac{1}{\Gamma(p)}\int_0^x (x-t)^{p-1}t^a dt = \frac{x^{p+a}}{\Gamma(p)}\int_0^1 \left(1-\frac{t}{x}\right)^{p-1}\left(\frac{t}{x}\right)^{a+1-1} d\left(\frac{t}{x}\right)$$

$$= \frac{x^{p+a}}{\Gamma(p)} B(p, a+1) = \frac{x^{p+a}}{\Gamma(p)} \frac{\Gamma(p)\Gamma(\alpha+1)}{\Gamma(p+a+1)} =$$

$$= \frac{\Gamma(\alpha+1)}{\Gamma(p+a+1)} x^{p+a} \tag{5.VIII}$$

We start with the following expression for the fractional generalized position

$$x(t) = D^{-a}\left(v_a \cdot t^m\right), \; 0 < a \leq 1$$

$$D^{-a}\left(v_a \cdot t^m\right) = v_a \frac{\Gamma(m+1)}{\Gamma(a+m+1)} x^{a+m} \tag{6.VIII}$$

example: $a = 1/2, \; m = 0$

$$D^{-a}\left(v_a \cdot t^m\right) = v_a \frac{\Gamma(m+1)}{\Gamma(a+m+1)} x^{m+a} = x^{1/2} \cdot \frac{2}{\sqrt{\pi}}$$

By use of the above equation for the fractional generalized position we can easily derive dilated time formula according to the famous light clock experiment [10] as below

$$(x(t))^2 + \left(c \cdot t_0\right)^2 = (c \cdot t)^2 \Rightarrow$$

$$t = \sqrt{\frac{1}{c^2}\left(v_a\right)^2 + \left(t_0\right)^2} \Rightarrow$$

$$t = \sqrt{t_0 + \left(\frac{v_a}{c}\right)^2 \cdot k^2 \cdot t^{2a}} \tag{7.VIII}$$

Our purpose here is to calculate t if we know to and α. If we want to solve and find t, in the general case we have to solve a transcendental equation of the form

$$t^2 - \left(\frac{v_a}{c}\right)^2 \cdot \kappa^2 \cdot t^{2a} = t_0^2 \Rightarrow$$

$$\left(\frac{v_a}{c}\right)^2 \cdot \kappa^2 \cdot t^{2a} - t^2 + t_0^2 = 0 \tag{8.VIII}$$

$$0 < a \leq 1, \; m = 0, \; k = \frac{\Gamma(m+1)}{\Gamma(m+1+a)} = \frac{\Gamma(1)}{\Gamma(\alpha+1)} = \frac{1}{\Gamma(\alpha+1)}$$

To solve the transcendental equation (8.VIII) we can use an iterative method to simulate the equation with the iterative procedure of the form.

If $\frac{p}{q} > 1$ then

$$x^p + a \cdot x^q - c = 0 \Rightarrow$$

$$x = \sqrt[p]{c - a\sqrt[p]{c - \ldots}}$$

We bring equation (8.VIII) into the form

$$\left(\frac{v_a}{c}\right)^2 \cdot \kappa^2 \cdot z^a - z + t_0^2 = 0 \tag{9.VIII}$$

$$0 < a \leq 1,\ 0 < \frac{v_a}{c} \leq 1$$

$$z\sqrt[d]{t_0^2 - \left(\frac{v_a}{c}\right)^2 \sqrt[d/h]{t_0^2 - \left(\frac{v_a}{c}\right)^2 d/h\sqrt{t_0^2 - \left(\frac{v_a}{c}\right)^{2d/h} \sqrt{t_0^2}}}} \tag{10.VIII}$$

where $d = 1,\ h = a,\ t_0 = ct$

$$t = \sqrt{z}$$

Example:

$$z - \left(\frac{v_a}{c}\right)^2 \cdot \kappa^2 \cdot z^a - t_0^2 = O \tag{9.VIII}$$

$$h = a = 1/2,\ \frac{v_a}{c} = 1/3,\ d = 1,\ d/h = 2,\ t_0 = 4\,\mathrm{sec},\ \kappa = \frac{2}{\sqrt{\pi}}$$

$$zt_0^2 - \left(\frac{v_a}{c}\right)^2 d/h\sqrt{t_0^2 - \left(\frac{v_a}{c}\right)^2 \sqrt[d/h]{t_0^2 - \left(\frac{v_a}{c}\right)^{2d/h} \sqrt{t_0^2}}}$$

$$t = \sqrt{z}$$

then $t = 3.859153 sec$
more exact $= 3.8623421 sec$

The theory of Fractional calculus can be used to model non-local solvation phenomena in space (-time). In particular, Fractional calculus an effective tool for describing relativistic phenomena in pseudo-Euclidean space-time. With this motivation we take fractional generalized relation for the known dilaton time to show the potential for future studies on fractional modified special relativity in the future.

IX. Velocity of light

The axiom that "the speed of light is constant for all inertial reference frames" is the cornerstone of the Special Theory of Relativity.

We therefore divide the issue into 2 areas

1) in the "Universal Physical Reality of the Universe" aspect (related to the regions of nonuniform gravitational field intensity)

2) in the "Local Time-Hour Domains" - the regions with uniform gravitational field intensity.Selectively we have more detailed:

For each case we have correspondingly:

1). From this Newton's law it is clear that space is immovable - in other words, that the "vacuum is immovable". This is undeniable, because the vacuum has no mass and gravitational forces do not attract it (space does not rotate with the Earth, only material bodies and molecules in the atmosphere).

Gravitational forces only contract space around itself and make it energetically denser. In other words, the scattering medium becomes denser in regions with stronger gravity .The result of a higher density of the propagation medium is that the frequency, wavelength and speed of any electromagnetic radiation in a vacuum ($c = \lambda \cdot v$) is reduced (it is harder for any electromagnetic radiation to propagate in the denser medium).

2). In regions with the same (uniform) gravitational field strength, the speed of light in a vacuum is a local constant, and this applies to the entire spectrum of electromagnetic radiation.As confirmed above, an important consequence of Newton's law of universal gravitation is that the empty space of matter (the medium of propagation of electromagnetic radiation) is stationary! Therefore, the measured speed of light is different with respect to the moving reference frames in still space.

IX.I. Real velocity of Light in future

Regions with not equal (non-uniform) gravitational field intensity and density According to the above we can accept that the universe is surrounded by a primordial sphere of radius So and the speed of light is expressed by Frencel's relation:

$$c_0 = \sqrt{k\frac{E}{\rho_0}}$$

If we assume that time t has elapsed from the moment of the big bang and what we assumed in 1) & 2) will hold true but in addition a. The universe is expanding uniformly with velocity V and b) it follows Fresnel's Law given earlier. If we distinguish the 2 states of the big bang initial and final we will get the relation:

$$\frac{c_0}{c} = \sqrt{\frac{\rho}{\rho_0}} \Rightarrow c = c_0\sqrt{\frac{\rho_0}{\rho}}$$

Since the charge of all free positive and negative infinite particles is Q, and of ether is Q'. Before and after the explosion remains constant, we will have:

$$Q = \frac{4}{3}\pi r_0^3 \cdot \rho_0 = Q' = \frac{4}{3}\pi R^3 \cdot \rho \Rightarrow$$

$$\frac{\rho_0}{\rho} = \frac{R^3}{r_0^3}$$

so we end up with

$$c = c_0\sqrt{\frac{R^3}{r_0^3}}$$

and since the radius of the sphere $R = Vt$ then we have and we get the final relation:

$$c = c_0\sqrt{\frac{v^3}{r_0^3}}\sqrt{t^3}$$

For 2 states let's calculate from the frontal moment after 2.5 million light years what the speed of light will be:

$$A = c_0\sqrt{\frac{V^3}{r_0^3}} = \text{ const}$$

For a distance equal to the Big Bang we will have for the future velocity the relation:

$$
\begin{aligned}
&c = A \cdot \sqrt{t^3} \Rightarrow \\
&\frac{c_1}{c_2} = \left(\frac{t_1}{t_2}\right)^{3/2} \Rightarrow \\
&\frac{c_1}{c_2} = \left(\frac{t_1}{t_1+\tau}\right)^{3/2} \Rightarrow \frac{c_1}{c_2} = \left(\frac{1}{1+\tau/t_1}\right)^{3/2}
\end{aligned}
\tag{IX.I.1}
$$

So we see that the speed of light is not a constant quantity but it is changing, increasing in the sparse density of existing space and decreasing. Because we believe in the expansion of the universe, we believe that it is moving to thinner states of space.

IX.II. Regions with the same (uniform) gravitational field strength and density

Let us imagine a point source (e.g. an oscillating point charge) vibrating at a point in space. Waves propagating in all directions in a homogeneous and isotropic medium will have spherical surfaces as their fronts. While in plane waves [6, 9] we $E = E(x,\ y,\ z,\ t)$, in the spherical waves are:

$$E = E(r,t)\mu\varepsilon r = \left(x^2 + y^2 + z^2\right)^{1/2}$$

The wave equation: $\frac{\partial^2 E}{\partial x^2} + \frac{\partial^2 E}{\partial y^2} + \frac{\partial^2 E}{\partial z^2} = \frac{1}{u^2}\frac{\partial^2 E}{\partial t^2}$

in the case of spherical coordinates where ($x = r\sin\theta\cos\varphi,\ y = r\sin\theta\sin\varphi,\ z = r\cos\theta$). Becomes (Figure 10):

$$\frac{1}{r^2}\frac{\partial}{\partial r}\left(r^2\frac{\partial E}{\partial r}\right) + \frac{1}{r^2\sin\theta}\frac{\partial}{\partial\theta}\left(\sin\theta\frac{\partial E}{\partial\theta}\right) + \frac{1}{r^2\sin^2\theta}\frac{\partial^2 E}{\partial\phi^2} = \frac{1}{u^2}\frac{\partial^2 E}{\partial E^2}$$

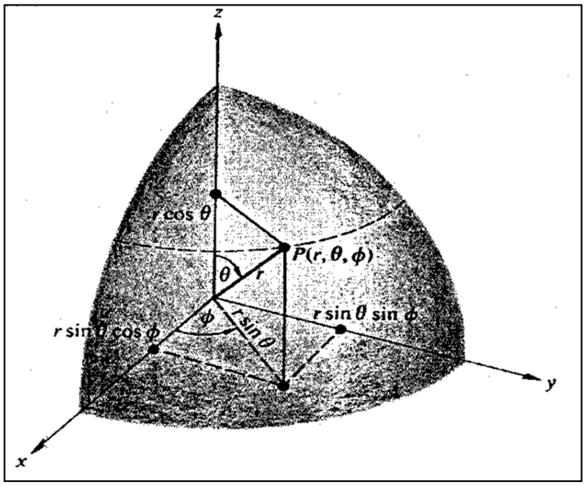

Figure 9:

But due to spherical symmetry $E(r,\ \theta,\ \phi,\ t) = E(r,\ t)$. Therefore $\frac{\partial E}{\partial \theta}$ and $\frac{\partial E}{\partial \varphi}$ is zero and the above equation is written:

$$\frac{1}{r^2}\frac{\partial}{\partial r}\left(r^2\frac{\partial E}{\partial r}\right) = \frac{1}{u^2}\frac{\partial^2 E}{\partial t^2}$$

After operations on the first member, this equation is successively written

$$\frac{\partial^2 E}{\partial r^2} + \frac{2}{r}\frac{\partial E}{\partial r} = \frac{1}{u^2}\frac{\partial^2 E}{\partial t^2} \Rightarrow \frac{1}{r}\frac{\partial^2 (rE)}{\partial r^2} = \frac{1}{u^2}\frac{\partial^2 E}{\partial t^2} \Rightarrow \frac{\partial^2 (rE)}{\partial r^2} = \frac{1}{u^2} r \frac{\partial^2 E}{\partial t^2}$$

Since r is independent of t, the previous equation is written:

$$\frac{\partial^2 (rE)}{\partial r^2} = \frac{1}{u^2}\frac{\partial^2 (rE)}{\partial t^2} \tag{IX.II.1}$$

The general solution to this is:

$$rE = f(r - ut) + g(r - ut) \Rightarrow E(r,t) = \frac{f(r - ut)}{r} + \frac{g(r - ut)}{r}$$

The second solution $\frac{g(r+ut)}{r}$ while mathematically acceptable has no physical content and must be rejected. Experience so far shows that when charges are accelerated (which are the sources of EM waves) the waves generated are directed to move away from the charges. So we accept waves generated by a source and propagating outwards. We should note that this is an additional condition that does not follow from Maxwell's equations. According to what has been said we will therefore have: $E(r,t) = \frac{f(r-ut)}{r}$. We find that the amplitude of the spherical wave is inversely proportional to r. Another problem of this solution is that at the position $r = 0 \Rightarrow u(r) \to \infty$. At the level of this discussion we will consider the above solution for all space except $r = 0$.

Variation of amplitude with distance for different types of waves

Variation of amplitude with distance for different types of waves

Where $E = uV$ where u the Energy density.

The energy passing through the isophasic surface A in time dt is $dE = udV = uAdr$ and therefore the rate of change of energy will be:

$$\frac{dE}{dt} = u \cdot A \cdot \frac{dr}{dt} = u \cdot AU$$

Where u: the speed of the wave.

A. Level waves

According to the conservation of energy theorem passing through two successive surfaces A1 and $A2$ in unit time:

$$\left(\frac{dE}{dt}\right)_1 = \left(\frac{dE}{dt}\right)_2 \Rightarrow u_1 \cdot A_1 \cdot U_1 = u_2 \cdot A_2 \cdot U_2 \xrightarrow{A_1 = A_2,\ v_1 = u_2} u_1 = u_2 \Rightarrow u = \text{const}$$

In the following we will see that $u \propto E_o^2$ and therefore : $E_{o,\text{ Level}} = \text{const}$

In plane waves the amplitude is kept constant since the isophase surfaces of the wave (plane) maintain a constant area.

B. Spherical waves

According to the conservation of energy theorem:

$$u_1 \cdot A_1 \cdot \cup_1 = u_2 \cdot A_2 \cdot \cup_2 \xrightarrow{v_1=u_2,\ A_1=4\pi r_1^2,\ A_2=4\pi r_2^2} u_1 \cdot 4\pi r_1^2 = u_2 \cdot 4\pi r_2^2 \Rightarrow u \propto 1/r^2 \overset{u\propto E_o^2}{\longrightarrow} E_0 \propto \frac{1}{r}$$

1.The universe is expanding in all directions at a constant speed.

2.The energy of the spherical E/M wave is kept constant in each phase of its emission.

Therefore apply $E = uV = uAdr$ where u: the energy density, A: isophasic wave surface, dr: distance along motion and therefore:

$$E = uV = uAdr \Rightarrow \frac{dE}{dt} = uA\frac{dr}{dt} = uAv$$

where u: wave speed.

According to the conservation of energy theorem for 2 time states we have:

$$E_1 = E_2 \Rightarrow u_1 A_1 v_1 = u_2 A_2 v_2 \Rightarrow u_1 4\pi \cdot r_1^2 v_1 = u_2 4\pi \cdot r_2^2 v_2 \tag{1'}$$

But apply $E_1 = \frac{4}{3}\pi \cdot r_1^3 u_1, E_2 = \frac{4}{3}\pi \cdot r_2^3 u_2 \Rightarrow u_1/u_2 = \frac{r_2^3}{r_1^3}$ (2′)

From $(1,2) \Rightarrow v_1/v_2 = r_1/r_2$ (3′)

This relationship gives us the relationship that relates the E/M wave velocity to functions of radial distance with respect to the point of emission. In combination with Hubble's law.

"According to Hubble's law, the galaxies around us are moving away at a speed V that increases as their distance R from us increases"

And the law is $R = Vt$.

Substituting into Law (3) we obtain for the speed of light with 2 states the formula.

$$c = c_0\frac{R}{r_0} = \left(c_0 \cdot \frac{V}{r_0}\right) \cdot t = f \cdot t$$

Where f is a constant quantity for our calculations.

To now calculate the velocity in two time states we will obtain the

$$\frac{c_1}{c_2} = \frac{f}{f} \cdot \frac{t_1}{t_2} = \frac{t_1}{t_2} \tag{IX.II.2}$$

and finally

$c_2 = c_1 \frac{t_1}{t_2} = c_1 \frac{t_1}{t_1 + \tau}$, τ the time in the future, $t_1 = 1.5 \cdot 10^{10}$ years

$t_1 =$ Total time to date

$t_2 = t_1 + \tau =$ Total time until the future

Examples.

If we ask to calculate the speed of light for $t_2 = 50.000$ years in the future, coming from a distance $t_1 = 1.5 \cdot 10^{10}$ years (let's assume from a distant galaxy) then:

Apply from (IX.II.2)

$$1 + \tau/t_1 = 1 + 50.000/1.5 \cdot 10^{10} = 1.000033334$$
$$c_1 = 300.000\ km/sec$$

We find

$$c_2 = c_0 \cdot (1/\,(1 + \tau/t_1)) = 300.001\ km/sec$$

Apply from (IX.I.1)

The essential difference lies in the fact that a spherical light wave has a linear emission relation and differs from the longitudinal one with the FRESNEL formula leading to a formula

$$c_2 = c_0 \cdot (1/\,(1 + \tau/t_1))^{3/2} = 300.001.5\ km/sec$$

which by extension is considered correct for emission along the path.

So according to Frensel's theory and the theory of spherical waves, the speed of light in space-time cannot be constant. This clearly contradicts the postulates of Einstein who wants the speed of light to be constant in the universe.

Epiloge

If we can calculate the velocity u'_x, which refers to S' of the system SS' (also for more general), we can calculate the other physical quantities. Here we follow the procedure of the Pythagorean triangle, i.e. the same procedure we used in the laboratory. The properties of time dilation and length contraction must therefore apply to the moving system. But they cannot apply to the stationary system. Why not? Because we have to keep the process homogeneous and uniform in both systems then we have to accept two coefficients γ_2 and γ_1. We will call γ_1 the moving system coefficient S' and γ_2 the correlation coefficient of the two systems S, S'. With this assumption we will calculate it by the same procedure as we calculated time and length in the laboratory. In contrast Lorentz followed an algebraic transformation identical to the interval and time observed by an observer. So we cannot use the same algebraic form transformation and visualize what happens simultaneously in both systems. We will follow equivalent relations to the Pythagorean theorem which are both schematically correct and consistent with the moving system, the stationary system, and both at the same time. This procedure leads to another completely different relation for u'_x & t', which changes all the resulting physical quantities. It is therefore a big open problem that apparently Einstein's formulas are wrong (u'_x & t') because they do not correspond, if $u = 0$ as the relative velocity of the moving system with respect to the stationary}, to the equivalence of the two states of laboratory and SS', which must be fully implemented as absolutely necessary.

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